INTELLIGENT TECHNOLOGIES IN EDUCATION

ChatGPT for educational-academic activities: Preschool student teachers' experiences

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Abstract

ChatGPT is a rapidly evolving generative artificial intelligence (AI) tool which has attracted wide interest in higher education. This study aims to provide evidence on the experiences of early childhood education students who have used ChatGPT for academic-educational activities. The participants were 17 Greek undergraduate students (future preschool teachers) and the data was collected via interviews. The findings indicate that positive experiences regard general type of benefits (e.g., fast generation of answers, ease of use, provision of information), support for educational activities (planning educational practices, interventions, and lesson plans), as well as provision of different perspectives and approaches (e.g., strategies that include children's social skills and ICT integration). Experienced limitations-challenges include reliability, validity of information, general-vague answers (e.g., ideas for educational practices), and limited contextual understanding. Submission of multiple queries/prompts for the generation of more relevant (and specific) information was experienced both as benefit and limitation. Students acknowledge and recommend ChatGPT as a useful, supportive tool for educational purposes, highlighting the necessity for university students' skill enhancement (critical evaluation of output, submission of specific queries). Implications for university students (training on effective and responsible use of AI tools), university policy, and educators are discussed. Universities need to respond to generative AI technology changes, by adopting or establishing appropriate policies.

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Introduction

Generative Artificial Intelligence (AI) technology evolves at an unprecedented pace and revolutionises natural language processing by understanding context and creating coherent text, enabling personalised education, automated content creation, and interactive tutoring (Mah et al., 2024). Traditional AI technologies are designed to mimic human intelligence, including tasks like recognition, decision-making, and problem-solving, while new generative AI (a subset of AI) specifically focuses on creating new content such as text, images, music, by learning patterns from existing data and generating creative-adaptive outputs. In educational context, key capabilities of generative AI such as personalised instruction-learning (tailoring educational content to individual student needs), content creation (generation of educational material), language translation (assistance with multilingual education through accurate translations), and assessment (automated grading and provision of feedback) have the potential to transform the educational process (Adiguzel et al., 2023; Nguyen et al., 2024). ChatGPT (Chat Generative Pre-Trained Transformer) is an AI tool, an advanced AI chatbot, which is trained on huge data from various sources; the focus of this study is on ChatGPT. Henceforth, the abbreviation AI is used for generative AI.

Various benefits are associated with ChatGPT's use in higher educational settings. These include generating new content and human-like responses, providing suggestions, and facilitating personalised learning (Dai et al., 2023). Facilitation of personalised learning takes place by adapting learning to individual needs, answering specific questions, providing tailored feedback, or supporting diverse learning preferences; the tool's different capabilities may support personalised learning, or enhance critical thinking skills. AI text generators (specifically ChatGPT) have the potential to impact critical thinking skill development via, for example, exposing students to different viewpoints-ideas (Essien et al., 2024). Other benefits include its assistance in conducting literature reviews, refining research questions, producing concise abstracts, finding academic sources, summarising research papers (Imran & Almusharraf, 2023; Bae, 2023), as well as aiding assessment marking and feedback (Roe et al., 2024). ChatGPT may assist literature reviews by quickly summarising research, identifying key themes, generating outlines, and suggesting relevant sources; thus aiding the research process. It also supports editing (Cooper, 2023), by suggesting improvements in grammar and structure, enhancing readability, refining academic tone, and offering feedback to strengthen students' writing. ChatGPT also aids language skill practice by engaging students in conversation, offering vocabulary and grammar tips, providing instant feedback, and enhancing confidence in language use (Adiguzel et al., 2023). It can assist in exam preparation by generating complex, in-depth answers (İpek et al., 2023), providing examples, and helping students understand challenging material to improve academic performance. Enhancement of learning and academic performance are associated with ChatGPT's capability to support students' academic activities by clarifying concepts, generating ideas, offering feedback, and helping structure assignments (Crawford et al., 2023). ChatGPT is fast-growing, has attracted wide interest and discussion in higher education (Nikolopoulou, 2024; Dai et al., 2023; Hsu & Ching, 2023), while it seems to be the first among the new AI tools that will make necessary to rethink the educational process (Trust et al., 2023).

In parallel, limitations, concerns, and ethical considerations have been raised (Imran & Almusharraf, 2023; Trust et al., 2023; Adiguzel et al., 2023; İpek et al., 2023; Sullivan et al., 2023;

Zhang & Aslan, 2021). Limitations and risks are often associated with biases or misleading information, inaccurate or unreliable output (İpek et al., 2023; Adiguzel et al., 2023), lack of transparency on how data is selected, giving personal data and sensitive information (Trust et al., 2023). Inaccurate or misleading information may be produced due to limitations in the tool's training data (potentially confusing students, spreading misinformation, and diminishing trust in AI's academic support/assistance). Transparency issues may arise because AI-generated responses lack clear reasoning pathways, making it challenging for learners to understand decision processes, or identify potential biases. Concerns and ethical considerations regarding academic integrity, cheating in assignments, overreliance on this technology, plagiarism, and potential misuse have been reported (Crawford et al., 2023; Imran & Almusharraf, 2023; İpek et al., 2023). For example, academic integrity concerns may arise, when students rely on ChatGPT's output for their assignments, risking plagiarism, reducing original thought, and undermining critical thinking processes. Additionally, limited context understanding may lead to misinterpretations of complex prompts, or oversimplified answers (thus, affecting its effectiveness).

AI is increasingly integrated into various educational domains extending beyond traditional computer science (Marengo & Pange, 2024), while ChatGPT usage among undergraduate university students is rapidly expanding (Ma et al., 2024; Strzelecki, 2024). However, research evidence on university students' (positive or negative) experiences of using ChatGPT for educational-academic activities is limited to specific academic disciplines (e.g., English as a foreign language -EFL, computer science and engineering), not including early childhood education students. To address this gap, the following research questions were addressed: (1) What benefits do early childhood education students experience when using ChatGPT for educational-academic activities? (2) What limitations and challenges do early childhood education students experience when using ChatGPT for educational-academic activities? (3) What are early childhood education students' suggestions on the utilisation of ChatGPT for academic activities? Examples of educational-academic activities include, creation of learning objectives on an educational topic/subject, design of lesson plans for the preschool classroom, and search for teaching practices, interventions, resources, or bibliography.

The structure of this paper is as follows: The following section regards the literature review, followed by the method, the results, the discussion (including implications and limitations of the study), and finally is the conclusion.

Literature

ChatGPT can be harnessed by university students (and future teachers) in various educational activities such as lesson planning assistance, search for educational resources, teaching practices and strategies. Indicatively, lesson plans generated by ChatGPT were effective in teaching primary school maths (Karaman & Goksu, 2024), while ChatGPT assisted-supported preschool teachers in instructional design (Chen et al., 2024). As mentioned earlier, research evidence on university students' experiences of using ChatGPT for educational-academic activities is limited to specific academic disciplines such as EFL and computer science. Currently, there is limited evidence about ChatGPT utilisation in the education field, with most studies being conceptual and lacking empirical research, while there is a scarcity in early childhood education (Luo et al., 2024). It is clarified that university students studying different academic subjects (early

childhood education, primary/elementary education, mathematics, science, EFL, literature, computer science, sociology, etc.) have the possibility to work as teachers, at different educational levels, according to the country's policy.

University students' perceived benefits when using ChatGPT for their studies

The experiences and perspectives of EFL undergraduate student teachers are reported by Kartal (2024) in Turkey, and by Bibi and Atta (2024) in Pakistan. Perceived benefits of using ChatGPT include access to information, enhancement of the educational experience, creativity, productivity and critical thinking (Kartal, 2024). Students who used ChatGPT as an AI-English writing assistant expressed an overall favourable opinion of ChatGPT, indicating ease of use, its potential to strengthen their writing skills and produce/create content in English, as well as its credibility in writing more quickly and effectively.

Benefits are also reported by students studying computer science (information technology), engineering and finance/business, in different countries such as the United Arabic Emirates (UAE) (Shoufan, 2023), Australia (Elkhodr et al., 2023), and the USA (Kim et al., 2024). More specifically, computer engineering students find ChatGPT interesting, easy to use, motivating, and helpful for study (e.g., as complementary learning resource) (Shoufan, 2023), while information technology students perceive it as a helpful and enjoyable learning resource/tool (Elkhodr et al., 2023). Students studying computer science and finance/business express an overall positive experience with ChatGPT as a supplementary tool in a data visualization course (Kim et al., 2024); perceived benefits include its usage as coding assistance, improving the quality and reducing the time spent on assignments, improved task efficiency, and on-demand accessibility. Also, postgraduate computer science students view ChatGPT as an aid in learning and teaching (e.g., in generating code) (Singh et al., 2023).

General type of benefits such as saving time, provision of information, personalised learning/feedback, and creating ideas are reported by undergraduate students (mainly studying information technology, business, media communication and linguistics) in Vietnam (Ngo, 2023), and by postgraduate (Ph.D) students (mainly studying open distance learning and educational technology) in Turkey (Firat, 2023). Pre-service Korean elementary teachers' perceptions-experiences about integrating ChatGPT into science learning activities reveal students' agreement in that ChatGPT could revolutionise knowledge construction through questioning (Lee & Zhai, 2024).

University students' perceived limitations and challenges when using ChatGPT in their studies

Perceived limitations and challenges are mainly reported by students studying computer engineering (Shoufan, 2023), computer science (Kim et al., 2024; Ngo, 2023), EFL (Kartal, 2024), mathematics (Gurl et al., 2024), and elementary education students (Lee & Zhai, 2024). Computer engineering students feel that ChatGPT's output/responses is not always accurate, while concerns about academic dishonesty are also expressed (Shoufan, 2023). Computer science (information technology) and finance/business students who used ChatGPT in a university course, report negative experiences that include inaccurate and misleading responses, difficulty in phrasing questions, lack of contextual understanding, and worries about developing

dependence (Kim et al., 2024). Concerns about misusing ChatGPT in academic activities were expressed by postgraduate computer science students (Singh et al., 2023). Undergraduate students of various disciplines (e.g., information technology, business, media communication and linguistics) express concerns about difficulties to assess the quality and reliability of sources, and inability to cite sources accurately (Ngo, 2023).

EFL students' perceived challenges-limitations are associated with lack of depth and authenticity, and overreliance on AI (Kartal, 2024). Pre-service mathematics teachers who used ChatGPT as a lesson planning assistant noted that its suggested lessons are teacher-centred and repetitive, thus indicating little knowledge of students' needs (Gurl et al., 2024). Concerns about accuracy and reliability of ChatGPT's responses, and the risks of becoming over-dependent on this tool were expressed by pre-service elementary teachers (Lee & Zhai, 2024), while concerns about assessment and ethical-social considerations were reported by postgraduate students (open distance learning and educational technology) (Firat, 2023).

University students' suggestions regarding ChatGPT' usage for academic purposes

In comparison to the number of studies regarding ChatGPT's benefits and limitations (according to university students), a smaller number of studies report on students' suggestions-recommendations in educational context. Students studying EFL (Kartal, 2024) and computer engineering (Shoufan, 2023) recommend ChatGPT as a supplementary learning resource. For example, a balance between AI-generated content and independent thought, peer-collaboration and guidance are highlighted by EFL students (Kartal, 2024). Mathematics student teachers' reflective statements about ChatGPT's output (after having used it as a lesson planning assistant) suggest the importance of critical and evaluative reflection (Gurl et al., 2024). In Ngo's (2023) study, undergraduate students of various disciplines made some recommendations to overcome barriers and improve the efficiency of ChatGPT. Such suggestions include addressing issues of reliability (e.g., checking ChatGPT's responses, verifying them from reliable sources), reducing over-dependence on this tool, and promoting academic integrity among students.

Gap in the literature and Rationale for the study

The aforementioned studies reveal the experiences-perspectives of university students (potential future teachers) who study specific academic subjects. The findings reveal a gap in the literature, with lack of studies regarding early childhood education students. The purpose of this study is to provide evidence on the experiences of early childhood education students (future preschool teachers) who have used ChatGPT for educational-academic activities.

The rationale for this study considered as starting points the limited empirical evidence on the topic, and the Greek context. More specifically, evidence is limited to specific academic disciplines (not including early childhood education students), and to the author's knowledge, there is no similar study within the Greek higher education context (it is noted that within this context, there is flexibility for educators to design the content of the university courses). The participants did not receive any type of training, and they used ChatGPT at home after their tutor's suggestion. Insights into university students' experiences enrich our understanding, and these need to be considered in order to better plan relevant courses/units and student training. Such training will also address limitations and risks such as inaccuracy, unreliability, limited understanding of

context, potential for plagiarism, and security concerns. ChatGPT is a new generative artificial intelligence tool which is rapidly spread among university students. The topic under investigation is an open research field that can be enriched with new evidence.

Method

The rationale of the methodological approach was to conduct interviews in order to enable in-depth exploration, as well as more detailed data collection on students' experiences.

Procedure and Sample

The research was conducted at the end of a course taught by the author-researcher, at the end of the semester, so that the students did not feel obliged to participate. The author conducted the interviews (the interview questions are shown in the next sub-section), while the students were informed about the research study's purpose and maintenance of their anonymity. The interviews were conducted one-to-one, in the lab, and the duration was about ten minutes. Participants were encouraged to answer with honesty, recalling and sharing their experiences.

The convenience sampling technique was used to reach the participants, and their willingness and accessibility for taking the interview were considered (Fink, 2011). Convenience sampling involves using respondents who are 'convenient' to the researcher. In this technique, the sample is the easiest for the researcher to access, and this can be due to geographical proximity, availability at a given time, or willingness to participate in the research. Convenience sampling is prompt and economical, while its disadvantages include the difficulty to replicate results or generalise the research findings (Golzar et al., 2022). The participation of the students was voluntary and ethical issues were considered in accordance with the General Data Protection Regulation.

The participants were 17 early childhood education students (preschool future teachers), who were studying at a Greek university. Sixteen students were female, one was male, and they were in their third or fourth year of study. It is noted that the majority of students studying in early childhood departments across the country are female. With regard to ChatGPT usage, most of the participants had no previous experience; only two students reported a previous experience of less than a year. The participants did not receive training in using ChatGPT, and they had completed an educational technology course which did not include a ChatGPT-related unit (the plan is to include such a unit during the next academic year). Students' willingness to participate was essential, and it was not a prerequisite to have an experience with ChatGPT. ChatGPT by OpenAI (2023) was used by students at home, after the tutor's suggestion. Examples of educational activities performed include: searching for lesson plans and teaching practices/strategies for the preschool classroom, obtaining ideas and learning objectives on an educational topic/subject, and exploring sources/bibliography. It is noted that prompts and answers were all in Greek language.

Research Instrument and Data Analysis

The data were collected via interviews in May and June 2024 (end of Easter semester). The interview questions were formulated after information emerging from international research and were in line with this study's research questions. The main interview questions were as follows:

What benefits have you experienced in using ChatGPT for academic activities? Were there any questions or activities that ChatGPT was particularly effective? What are the limitations and challenges you have faced/experienced when using ChatGPT for academic activities? What do you suggest with regard to the use of ChatGPT by students for academic purposes?

Descriptive content analysis was used, and the codes for the data analysis were descriptive. Through the coding process, patterns of responses were used to inform themes and categories generated in line with their relevance to the research questions (Creswell, 2012). Students' responses were thematically grouped into what was related to the pre-determined themes of benefits and limitations-challenges when using ChatGPT (as experienced by students), as well as students' suggestions regarding ChatGPT usage for academic-educational activities. To ensure anonymity, codes were used for the students.

Results

The results are organised by the three research questions guiding this study, which formed the main themes. In Tables 1-3, the categories are indicated in the first column, and the sample codes in the second column (the number of references/replies are presented in parenthesis). In this section, examples of excerpts are particularly highlighted, because participants' quotations add depth to the findings, offering real-world perspectives. In excerpts, the codes S1-S17 are applied for the students, i.e., S1: Student 1, S2: Student 2 etc. To avoid confusion, 'children' is used for young preschool children, while 'students' refers solely to university students.

Students' experiences of benefits when using ChatGPT for academic activities

Table 1 indicates the categories and codes of the first theme (benefits when using ChatGPT, as experienced by students). The benefits are grouped under the categories general type of benefits, support for educational practices/strategies/activities, and content of educational practices/activities; students' responses are categorised into three categories.

Table 1

Categories and codes of the first theme (benefits when using ChatGPT)

Categories	Sample Codes
General type of benefits	Fast generation of answers, text (14)
	(saving time)
	Ease of use (12)
	Source of (large amount of) information, learning resource (11)
	Source of inspiration for ideas, discoveries, approaches (10)
	Provision of multiple perspectives (9)
	Possibility for further development of an answer/topic, if asked (9)
	Immediate communication, interactivity (between user-ChatGPT) (7)
	ChatGPT's wording is human like (5)

	Efficient, effective and accurate (5)
Support for educational practices, strategies, activities	Useful assistant, support when planning educational practices, activities, lesson plans (13)
	Useful structure/organisation, structured outlines (for lesson plans, pre-writing an assignment) (12)
	Provision of various stimuli for educational practices (7)
Content of educational practices, activities	Different perspectives and approaches for educational practices, interventions (9)
	Strategies, activities, lesson plans that strengthen young children's skills (e.g., social skills, creativity), experiential learning (7)
	Educational practices, activities include ICT use/ interventions (6)
	Design of teaching interventions consistent with pedagogical principles (4)
	Educational strategies deal with current issues (3)
	Pedagogical suggestions consistent with the literature (e.g., ways of integrating students into a multicultural school) (3)

The comments of the students indicate that the majority of them experienced general type of benefits such as fast generation of answers (14 replies), and ease of use (12 replies). Examples of excerpts regarding such benefits were: "It gives answers quickly, without the need to use specialised vocabulary" (S9); "I was able to find answers to my questions within a very short period of time, saving time" (S4); "It was simple to use…The answers given to me were immediate, within a few seconds, saving me time" (S2). Likewise, Student (3) commented on ease of use: "Easy to use…ChatGPT's answers in the form of categorisation facilitates further investigation, e.g., approaching the subject from different perspectives" (S3). Some participants experienced the benefit of using ChatGPT as a source of information (11 out of 17), source of inspiration for ideas/discoveries/approaches (10 out of 17), while about half of the sample (9 out of 17) characterised it as a source of provision of multiple perspectives. According to Student (1) "A huge amount of information is offered on anything you search for, from scientific theories to educational activities for kindergarten" (S1). About half of the sample (9 out of 17) acknowledge as benefit ChatGPT's possibility to develop further an answer/topic when asked (i.e., by asking/entering additional prompts/questions). Indicative excerpts were: "It is possible to enter additional clarifying questions in some 'chat' so that we can get more details regarding our question" (S13); "In case someone just doesn't like the initial answer, ChatGPT can evolve it, with the user's directions" (S1); "In the alternative wording of my (initial) question, it provided interesting learning objectives…corresponding to telling stories and creative expression through painting, something that kids really like" (S4); "I have noticed that ChatGPT is more effective when further clarifications are 'entered', it gave a more specific direction to its responses" (S17). The benefits of immediate communication and interactivity were highlighted by Students (10) and (8) as follows: "I consider it as an interactive way of learning/searching, as the user can adapt it to her needs" (S10); "Its 'speech' is as it would be of a human being, simple and understandable. One of the most important benefits of ChatGPT is the immediate response it provides" (S8).

As seen in Table 1 (within the category ‘Support for educational practices, strategies, activities’), most participants (13 out of 17) characterised ChatGPT as a useful supportive tool when planning educational practices, activities, or lesson plans. Examples of excerpts highlighting ChatGPT as a useful supportive tool, by also mentioning other benefits (such as provision of different perspectives, and efficiency) are indicated below: “It can be a very important assistant for the creation of educational activities. ChatGPT can provide a variety of ideas to an educator” (S14); “It can be a source of inspiration…for organising a lesson plan” (S9); “It gives different stimuli to the user, in order to reflect on her own educational practices, deciding on possible modifications that will suit the context of her class” (S6); “As far as educational activities are concerned, it was also in this category very effective. It designed in just a few seconds an entire activity which lasts four weeks and covers educational objectives, time scheduling, etc.” (S1); “At the end, it gave me a useful tip: This lesson plan can be adapted to suit your classroom needs and available time” (S8). Multiple students (12 out of 17) experienced the structure/organisation of ChatGPT’s answers as particularly useful. Statements associated with the output’s structure-organisation (i.e., as a list) were: “The information given each time, is organised in a list format, it is made easier for us to read and understand” (S4); “Answers are even categorised with bold fonts and numbering. This way of presenting the information helps understanding, as the categories are clear; e.g., I search for a lesson plan and the answer has the categories objectives, materials, activities” (S10).

With regard to the content of educational practices, activities (last category in Table 1), about half of the sample (9 out of 17) reported the provision of different perspectives and approaches. This benefit was often associated with ChatGPT’s support, as expressed by Student (12): “It (ChatGPT) is particularly effective in providing different perspectives and approaches, so that the teacher can critically examine them and shape her own educational intervention” (S12). Some participants commented on the strategies, activities, lesson plans that strengthen young children’s skills (e.g., social skills, creativity), and experiential learning. Indicative insights were: “Auxiliary, supportive tool in the educational process with the aim of enhancing young children’s learning and skills” (S5); “(via the generated activities) children' social skills and their ability to communicate are strengthened” (S12); “It offered me many suggestions…activities that strengthen (children’s) language and other skills and raising awareness of environmental issues” (S6). Some students reported/commented on young children’s skills and experiential learning in association with educational practices/interventions that integrate ICT (digital tools). Examples of such excerpts were: “The educational strategies it suggests deal with current issues and include the integration of ICT tools (e.g., educational games, interactive multimedia) …The activities proposed strengthen the development of (children’s) skills such as communication, cooperation and understanding of multiculturalism” (S3); “The (generated) teaching plan was based on experiential learning, and included observation, pedagogic games, integration of ICT tools…similar to what we are taught at university courses” (S8); “The suggested activities with digital games focus on important areas of learning such as respect, cooperation and interaction among children in the class” (S17); “Such methods correspond to contemporary educational needs, taking into account the importance of digital technology in schools” (S17). Other views associated the content of educational practices/activities with pedagogical issues, for example: “The didactic intervention had the form indicated in the scientific literature, i.e. with reference to the educational objectives, the process and its duration… its answer seems to be consistent with

modern pedagogical principles focusing on interaction, collaboration and the development of critical thinking" (S11); "I find it excellent for planning educational activities, as it covers all stages (introduction, experiments, etc.)" (S1); "ChatGPT was quite effective in the answers it gave me about school bullying, with examples of group activities and lessons…As a future teacher, I would adopt the process of using ChatGPT for learning materials and (educational) activities" (S2).

Students' experiences of limitations and challenges when using ChatGPT for academic activities

Table 2 indicates the categories and codes of the second theme (limitations-challenges when using ChatGPT, as experienced by students); students' responses are categorised into two categories.

Table 2

Categories and codes of the second theme (limitations-challenges when using ChatGPT)

Categories	Sample Codes
General type of limitations, concerns	Reliability, validity of the information (10)
	General, vague answers (9)
	More (specific) prompts are required for clarifications (8)
	Answers are often incomplete, there is a word limit (7)
	Superficial answers, lack of depth (6)
Educational-related limitations, concerns	Provides general ideas for educational interventions (8)
	Limited (or lack of) contextual understanding (e.g., classroom needs) (6)
	Initial answers/responses not supported by literature (5)
	Provides literature out of date (5)
	Educational strategies do not include possible obstacles/difficulties (4)
	Lack of (specific) examples to support the generated goals (4)
	Difficult to answer requests about specific education topics (3)

Under the general type of limitations and concerns (first category of Table 2), views regarding reliability and validity of the information were the most frequently mentioned (10 replies). Examples of excerpts regarding such limitations were: "Inaccuracy and unreliability, it is not always completely accurate…sometimes it can produce wrong information" (S5); "There is no citation of bibliographic references along with the answers generated each time. For this reason, we cannot know how reliable and valid this information is" (S14). About half of the sample (9 out of 17) acknowledge as limitation ChatGPT's generation of general-vague answers. Such concerns were emphasised by Students (12) and (13) as follows: "I can't claim it was particularly effective in any of my queries, it was somewhat vague" (S12); "The main limitation I encountered is that its answers are characterised by vagueness and generalisation" (S13). To overcome the

limitation of general output, some participants (8 out of 17) shared the need to enter more (specific) prompts/queries; in order to obtain clarifications and more effective answers. Relevant excerpts were: “The only negative I can find is that some answers were general and if I wanted something more specific I had to ask another question” (S15); “When I asked for specific theoretical information, ChatGPT simply listed the answers, without supporting them with relevant literature. Of course, this is not a particular problem, since if a second question/prompt follows regarding the documentation of the bibliography, it answers directly and relatively” (S1); “At first it (ChatGPT) couldn't understand my question, I had to submit it twice” (S4).

Within the context of educational-related limitations and concerns (second category of Table 2), about half of the sample (8 out of 17) expressed concerns regarding the provision of general ideas for educational interventions/activities. Indicative statements were: “It gave a general answer…lack of examples to support the educational goals” (S7); “It can provide general ideas for teaching interventions, but it lacks the expertise and experience of education specialists” (S9); “The information provided is not specific enough to be implemented directly by the teacher. For example, when referring to ‘interactive multimedia lessons’ it leaves open the question of how exactly these activities will be structured” (S15); “Providing general ideas without focusing on specific examples; e.g., mentioning specific ‘language games and apps’ and how they can be used in preschool classroom” (S3). Some participants (6 out of 17) commented on the limited or lack of contextual understanding. Such insights were expressed as follows: “The most important limitation in the design of the educational intervention is the inadequacy of understanding the context and the needs of the classroom. ChatGPT can provide educational interventions, but it is not aware of the specific environment and circumstances. The educational objectives are arbitrarily formulated, they do not give a clear direction on methods and strategies” (S17); “For example, it (ChatGPT) may have told me how to organise the educational activities, but it did not take into account that it is a class of twenty children, each one of them different from each other, that we now live in a multicultural society, so some children may not be able to understand” (S6); “The suggested (teaching) interventions may not be easily applicable in different educational realities, such as different countries or regions with different cultures…there is insufficient adaptation to the different (children) age groups” (S16). Two participants expressed their concerns about literature-related limitations: “The literature generated is not up-to-date” (S7); “The bibliography showing where the information it produces comes from, is not listed” (S8). Other educational-related concerns as noted by two students were: “No reference is made on possible obstacles or challenges that may arise in the implementation of an educational strategy; e.g., possible hardware shortages” (S10); “I don't think that the answers given to me were completely effective, they were satisfactory…important elements such as teacher training or the inclusion of parents were missing” (S4).

Student suggestions regarding the utilisation of ChatGPT for academic activities

Table 3 shows the categories and codes of the third theme (student suggestions regarding ChatGPT usage in academic-educational activities). Students’ responses are categorised into three categories: useful-supportive tool, university students’ practices/skills, and ethics.

Table 3

Categories and codes of the third theme (student suggestions for ChatGPT usage in academic activities)

Categories	Sample Codes
Useful, supportive tool	Useful tool for various academic-educational purposes (generation of ideas, information search, writing assignments, research, etc.) (12)
	Useful for new perspectives, approaches, directions (10)
	Supportive, supplementary tool (9)
University students' practices, skills	Evaluate responses, and sources of information (13)
	Enhancement of student skills (e.g., critical thinking) (10)
	Submit specific supplementary questions/prompts/instructions (8)
	Check reliability of information (5)
	Juxtapose/verify ChatGPT's answers with information from other sources (4)
	Specify the (educational) context (4)
Ethics (e.g., plagiarism)	Use with measure (for specific activities, avoid bad practices) (3)
	Ethical use, avoid plagiarism (3)
	It cannot replace teacher-student communication (3)

Under the first category of Table 3 (useful, supportive tool), most of the students (12 out of 17) suggest ChatGPT as a useful tool for various academic-educational purposes (e.g., to generate ideas, search for information, write assignments, conduct research). Examples of excerpts were: "ChatGPT can be useful for students for their academic purposes. Depending on how it is used, it can help with research, writing, generating ideas and improving general understanding in various courses and assignments" (S3); "Valuable tool for searching and processing information" (S14). It is noteworthy that several students (10 out of 17) attributed ChatGPT's usefulness to its capability to generate new perspectives/approaches/directions. Relevant insights were: "I would suggest using ChatGPT as a helpful tool to approach issues from different perspectives" (S13); "Useful (tool) because it offers new perspectives, approaches, and directions" (S17); "Students should use ChatGPT to get ideas for the structure and direction of their assignments" (S8); "It can help students determine the direction of their work and organise their thoughts before starting the written tasks" (S16). One participant expressed its usefulness with regard to improving language: "It can be used to spot and correct spelling or grammar mistakes and improve sentence structure" (S12). About half of the sample (9 out of 17) suggest ChatGPT as a supportive, supplementary tool. Students (2) and (15) shared: "Us students, should realize that this is a new complementary tool and not rely only on it to complete our work/assignments" (S2); "Rather than being seen as an absolute source of information, students can use it to generate and refine ideas. A good way is to use the responses as a starting point for further research and thought" (S15). Similarly, some participants highlighted ChatGPT's support-usefulness in connection to obtaining initial ideas and

plans; without completely relying on artificial intelligence. Examples of relevant statements were: “It may be useful, but (students) should not completely rely upon it. Useful to create an initial plan or structure for their work” (S5); “I would suggest that students use it only to get inspiration for their work and at the same time not to use it completely (not being fully dependent on it) as there is the possibility of wrong information” (S4); “The use of ChatGPT for academic purposes by students, I believe, should be limited. Its ideal use should only be related to the domain of inspiration for some activity…it will need to be edited afterwards to connect it to the context” (S1).

The second category in Table 3 refers to university students’ practices and skills. Most participants (13 out of 17) pointed out the need (for students) to evaluate responses and to juxtapose/verify ChatGPT’s output-answers with information obtained from other sources. Indicative examples of such views were: “They (students) should be able to evaluate and verify the answers based on their own knowledge but also by looking for further information from other sources” (S7); “Students need to recognise the quality and reliability of the information they receive, and to assess any potential biases or limitations that may exist in ChatGPT's responses” (S3); “They (students) can gather valuable information about their academic work and find relevant resources to support the answers” (S5). Multiple students highlighted the need for enhancing student skills (e.g., critical thinking) in order to effectively evaluate ChatGPT’s responses. Relevant insights were: “It is important to encourage critical thinking and develop skills in evaluating the information produced by ChatGPT” (S16); “Students should be exercised to collect, analyse and interpret data from multiple sources, thus broadening their understanding and improving their research skills” (S17); “Checking sources and critical analysis of information remain fundamental principles of academic research and work” (S12); “Critical evaluation of (generated) information is crucial” (S2). In order to obtain (more) relevant information, several students suggest the need to submit (specific) supplementary questions/prompts/queries (8 replies). For example, Student (9) noted: “Submit supplementary questions to the system if the answers given do not satisfy them (the students) and are not complete. In general, I think it would be good to ask specific and clear questions” (S9). The need to specify the educational context was highlighted by Student (3): “The student must clearly articulate the context and the objectives of his intervention, the age-range of children, so that ChatGPT can provide more specific and tailored answers” (S3).

It is important to note that, in comparison to the aforementioned recommendations, a small number of replies pointed out ethical issues (e.g., avoidance of bad practices, plagiarism), as indicated in Table 2; this has implications for student training (discussed within next section). Views on ethics were: “We must use it ethically and think critically about what we read…several students ask questions to ChatGPT and then (via copy and paste) they end up writing an assignment by copying from the internet” (S8); “It should be used with measure to avoid bad practices, e.g. copying, plagiarism, and it is very important to check the reliability of the information” (S10). Finally, one participant shared a view regarding the aspect of communication: “We still have a lot to learn, however, it will never replace the communication between the teacher and the student, as for the transfer of knowledge, a necessary condition is human communication and an emotional approach” (S2).

Discussion

This study investigated Greek student teachers' (future teachers in preschool classrooms) experiences of ChatGPT usage for educational-academic activities. Understanding students' perceived benefits and limitations may help make the best possible use of AI tools, to support these future teachers in creating suitable learning experiences for young children. The findings contribute to the increasing body of research evidence on student experiences and perspectives regarding ChatGPT, and have implications for students, educators, and university educational policy.

With regard to the first theme (benefits experienced by students when using ChatGPT), the benefits were grouped under three categories, general type of benefits, support for educational practices/strategies/activities, and content of educational practices/activities (see Table 1). General type of benefits mainly regards fast generation of answers/text (14 replies), ease of use (12 replies), source of large amount of information, learning resource, source of inspiration for ideas/approaches, multiple perspectives, possibility for an answer's development, and communication (shown under the sample codes of the first category, Table 1). These findings confirm existing literature on university students' views. General benefits such as ease of use (Kartal, 2024; Shoufan, 2023), fast generation of responses and time saving (Kim, 2024), access to information (Kartal, 2024; Bibi & Atta, 2024; Ngo, 2023), and generation of ideas (Ngo, 2023; Sarwanti et al., 2024) have been reported in recent studies with university students. However, as discussed in the literature, student disciplines in existing studies mainly regard EFL, computer science, and engineering, and do not include early childhood education. In this study, many students (13 out of 17) experience ChatGPT as a useful assistant and supportive tool for their academic-educational practices, activities, or lesson plans, and this useful experience is often associated with the output's structure/organisation (sample codes of the second category, in Table 1). This finding aligns with existing studies (Elkhodr et al., 2023; Singh et al., 2023; Kim, 2024; Gurl et al., 2024) which illustrated that ChatGPT was perceived by students as a helpful tool/resource, and as an aid-supplement for their academic learning. Generating lesson plans can actually serve as a starting point for pre-service teachers, since they have no teaching experience. A study (Kotsis, 2024) reported that ChatGPT can be a valuable tool for primary school (student) teachers when designing worksheets for physics experiments (e.g., using ChatGPT's features to develop stimulating and interactive exercises). With regard to the content of educational practices/activities/strategies (Table 1, third category), almost half of the sample (9 replies) experience as benefits the different perspectives and approaches generated, followed by young children's skills (e.g., social skills, creativity), the inclusion of ICT tools/interventions, and alignment of generated teaching strategies with current pedagogical issues-principles. Their pedagogical knowledge seems to have affected their views on classroom practices/strategies. Different university modules/courses (apart from computer science courses) could incorporate responsible use of ChatGPT, and appropriate educational practices should be encouraged in order to maintain and ensure positive learning experiences (discussed in implications). It is highlighted that aspects of perceived benefits are closely associated with participants' discipline, and have not been reported in existing literature. That is, early childhood education students experience as benefit the generation of various educational practices and interventions for preschool classrooms, such as practices that align with pedagogical principles in terms of

children's development of skills, or inclusion of ICT. Recent research revealed perceived benefits in association with students' discipline; for example, strengthening of writing skills as indicated by EFL and language students (Kartal, 2024; Sarwanti et al., 2024), and assistance in generating code as reported by computer science students (Kim et al., 2024). Identifying similarities and differences among students studying different subjects constitutes an issue for future research.

With regard to the second theme (experienced limitations and challenges when using ChatGPT), general type, and educational-related limitations/concerns were reported (see Table 2). General type of limitations and concerns mainly regard reliability and validity of generated information, general/vague answers, need for specific prompts, and incomplete/superficial answers (Table 2, sample codes of the first category). Indeed, ChatGPT may occasionally produce incorrect outputs, including references (Sallam, 2023). There is an agreement with existing research since general output-answers, lack of depth, and concerns about reliability of information have been documented by students of different disciplines (e.g., Kim, 2024; Kartal, 2024; Ngo, 2023). Educational-related limitations and concerns regard general ideas for educational interventions, limited contextual understanding, answers not supported by literature, and lack of possible obstacles or specific examples within the generated educational strategies (see Table 2, sample codes of the second category). Lack of contextual understanding was a negative experience, and this finding is confirmed by computer science and finance/business students (Kim et al., 2024), as well as language students (Sarwanti et al., 2024). Indeed, artificial intelligence sometimes fails to grasp context correctly (Essien et al., 2024). A finding scarcely reported in existing literature was participants' experience on the lack of specific examples within the educational strategies generated (e.g., examples that relate to preschool classroom needs). General output is associated with the need for entering further queries/prompts for clarifications, or more relevant answers, and this was recommended by some participants. It is noteworthy that the limitations and concerns reported by the participants were, overall, fewer than the benefits reported, a finding that advocates for the necessity of student training (discussed in implications).

With regard to the third theme (student suggestions for ChatGPT usage in academic-educational activities), the categories useful-supportive tool, university students' practices-skills, and ethics were identified (Table 3). The majority of participants recommend ChatGPT as a useful tool for various academic-educational purposes, acknowledging it as a tool that generates different perspectives/approaches/directions, and as a supportive-supplementary tool (see Table 3, first category). This finding is confirmed by existing literature, since students of different disciplines recommend ChatGPT as a supplementary learning resource; indicatively, EFL students (Kartal, 2024), and computer engineering students (Shoufan, 2023). The participants of this study also report on university students' skills, and associated practices (Table 3, second category). That is, their suggestions point out: the need for university students to critically evaluate ChatGPT's responses-output and sources of information; the need for enhancing student skills such as critical thinking; the submission of specific supplementary questions/prompts/instructions in order to obtain more relevant (and specific) output; the need to juxtapose, verify ChatGPT's answers with information from other sources. The findings confirm recent research (Gurl et al., 2024; Ngo, 2023) in which students suggest critical reflection/evaluation of ChatGPT's output. There is also an alignment with a recent study (Lee & Zhai, 2024), in which primary school student teachers note the necessity for multiple searches to get answers from ChatGPT through continuous

questioning (consecutive/continuous questioning refers to the capability to pose consecutive questions). With regard to ethical issues (Table 3, third category), a very small number of participants pointed out ethical issues such as avoidance of bad practices, or plagiarism. This finding also advocates for the necessity of student training (discussed in implications). Ethical considerations were shared by undergraduate (Ngo, 2023) and postgraduate (Firat, 2023) students of different disciplines.

In general, the findings provided evidence that ChatGPT was experienced as a useful and supportive tool for student teachers' educational-academic activities. Recent research (Essien et al., 2024; İpek et al., 2023) indicated integration of ChatGPT into education as a supportive-supplementary tool. Educational-academic activities that could support university students' (future teachers) learning may include: lesson planning assistance (student teachers interact with ChatGPT to obtain ideas for lesson plans, learning objectives on different topics, or teaching strategies); content knowledge enhancement (students ask ChatGPT questions on subject content, educational/pedagogical theories and teaching practices, with specific examples); critical thinking activities (evaluate different perspectives); inclusion activities (students harness ChatGPT for inclusive learning practices/environments that incorporate, for example, hands-on practice and interactive technology). It is noteworthy that ChatGPT's function that specific prompts and consecutive questions may generate more clarifications on an answer/topic, was experienced both as benefit and as limitation. About half of the participants reported as benefit the possibility to further develop/evolve an answer (if asked), while the need for submitting specific prompts (to avoid general answers) was experienced as limitation. This finding suggests the need to exercise/develop students' skills in formulating appropriate questions/prompts. Student training and educators' guidance can facilitate application of effective techniques for creating prompts. For effective utilisation of ChatGPT, students must have an adequate background in the relevant field of study in order to generate appropriate prompts and critically evaluate the responses (Shoufan, 2023).

The benefits and limitations-concerns experienced by students, are reflected on their suggestions. For example, the benefits of ChatGPT being a source of information, ideas, educational practices and perspectives, are reflected on their suggestions about its usefulness for educational purposes. Some students stressed its usefulness for the production of initial ideas, without fully relying on it. Although ChatGPT may be beneficial in educational settings, it should be carefully integrated to ensure it supports-complements rather than replaces traditional learning methods (Essien et al., 2024; Nikolopoulou, 2024). Tutors could encourage ChatGPT's usage for developing further the ideas, but the output should not be considered as the final one; it necessitates human critical review and evaluation. A study (Lazareva et al., 2024) reported that student experiences with using ChatGPT in history classes were, overall, useful and positive experience, in particular, when it came to brainstorming (providing them with ideas and starting points). In this study, experienced limitations regarding general answers and limited contextual understanding reflect on participants' suggestions to submit additional supplementary (and more precise) instructions/questions/prompts. Also, with regard to reliability of information, many participants highlight the importance of university students' skills and practices; e.g., the need to evaluate the output/responses, and check the reliability of information.

It is acknowledged that the use of NVivo, or other software, would strengthen the study's methodological depth, thus it is suggested as an issue in future research. Using NVivo enhances qualitative analysis by systematically organising and coding textual data, thus enabling researchers to identify trends and patterns, with rigor and transparency (Allsop et al., 2022). The software facilitates in-depth thematic analysis, reduces bias through structured workflows, and provides visualisation tools for robust data interpretation, ensuring reliability and replicability in qualitative research.

Implications

The study has implications for students, university policy makers and educators. The positive experiences suggest that incorporating ChatGPT in academic-educational activities could enhance students' learning experiences. In parallel, students experienced negative experiences/consequences when using ChatGPT, and this suggests the need for guidance, and training. Early childhood education students may use ChatGPT as a supportive tool both for their academic assignments (similarly to students of other disciplines) and for designing lesson plans and learning activities for the preschool classroom. Thoughtful guidance should be provided, because any generated teaching material should align with learning objectives, and young children's cognitive development. Student training on effective and responsible use of AI tools (such as ChatGPT) is suggested. Pre-service teacher training programs and courses could incorporate an AI-related unit to provide practical and positive experiences, to enhance AI literacy and skills (e.g., creation of effective and specific prompts, critical evaluation of the output), and increase confidence among students. Training will aid students to understand AI capabilities and make informed decisions about ChatGPT usage, as well as acknowledge its limitations and consider ethical issues; for example, it is important to evaluate the quality and correctness of the content produced, particularly within academic context. Preschool student teachers' training on ChatGPT capabilities, opportunities-advantages and limitations-challenges is important, because AI opens new domains (and) in early childhood education (such as AI literacy and social interaction) (Luo et al. 2024). Although more and more AI devices target young children (e.g., intelligent robots that interact with humans), empirical evidence on AI's actual use in preschool settings remains scarce (Su & Yang, 2022; Samara & Kotsis, 2024). Preschool student teachers' training could provide practice in designing learning activities for children with the support of AI tools/platforms (Su & Yang, 2022), and also include the possible impact of ChatGPT on children's motivation and, predominantly, its possibilities to enhance the teaching process (Luo et al., 2024). Experts from diverse institutions, countries, and regions highlight such issues, and predict that ChatGPT should be harnessed as a resource rather than as a replacement for educators' actions Luo et al. (2024). However, we cannot expect from student teachers to be aware of these, unless appropriate training is provided.

Halaweh (2023) argues that for responsible and successful implementation of ChatGPT, students need to develop skills for critically, analysing, evaluating, and interpreting information (to distinguish reliable resources from misinformation). Universities could adopt or establish (new) policies and procedures and train-guide students to become AI literate (AI-based tools such as ChatGPT have the potential to support learning and teaching, but there are limitations). ChatGPT policies need to consider issues of privacy, digital divide, and ethics (Khowaja et al., 2024).

Universities should respond to AI technology changes, by adopting policies that facilitate the maintenance of students' academic integrity and protect their privacy and safety.

As educators' role is crucial, university tutors could receive guidance on relevant issues such as: encouragement of responsible and fruitful use of AI (by students); detection of AI-created content; adaptation of homework assignments to reduce cheating using AI tools (e.g., ChatGPT); management of students who do not follow rules on AI usage for academic work; responsiveness if they suspect students are using AI in ways that are not allowed. University educators could be included in the process of shaping policies about using AI tools within their department/faculty (i.e., by providing input). Tutors need to provide guidance-instructions on AI use to support learning. Although ChatGPT can be an effective tool for the initial idea generation or development of research outline, students may encounter some challenges with regard to literature synthesis, citations and data analysis (Rahman et al., 2023). Early childhood education instructors need to understand the use of ChatGPT to offer optimal guidance to their students. It is essential to provide thoughtful and careful guidance regarding their students' use of ChatGPT, particularly in monitoring for less positive or negative experiences (to ensure students have a good learning experience).

Limitations

Limitations include the small sample size, the homogeneity of the sample (in terms of gender, academic field and previous experience with ChatGPT), and the use of only a descriptive content analysis. Not using NVivo software in qualitative analysis, was a methodological constraint. This limits systematic data management and may reduce transparency in identification of key themes in the data; manual analysis increases the risk of researcher bias, inconsistency, potentially affecting the replicability and depth of insights compared to software-aided approaches. A disadvantage of the convenience sampling technique is that the sample is not fully representative of the population being studied (since it relies on location and accessibility of respondents). The findings of this study are not generalisable, as responses may not accurately represent the experiences-perspectives amongst all students. The fact that most participants had no previous experience or training on ChatGPT use, is linked to the need for student training and guidance (discussed earlier in implications). It is a necessity to conduct studies with larger and diverse samples of university students (future teachers) and to compare similarities and differences. For student teachers, different teaching fields and educational levels (e.g., mathematics, languages, primary or early childhood education level) have unique needs, and content complexities (often associated to different pedagogical approaches). Investigating these differences enables more relevant AI support tailored to students' future teaching roles. It is planned to conduct a quantitative study with a questionnaire, administering it to a larger student population (and possibly to diverse cultural backgrounds). In this study, all prompts entered to ChatGPT and its answers were in Greek language, and the findings might be different if the English language was used. The responses in Greek are contextually appropriate, but these might be less detailed due to relatively lesser data available in Greek compared to English language (i.e., vast amount of available data results in more detailed, varied responses).

Conclusion

There has been a rise in the number of studies exploring ChatGPT usage in higher education (Mah et al., 2024; Strzelecki, 2024). Although the findings of this study may not be generalisable, these contribute insights, and establish a stage for future research to build upon them. Evidence is added to the growing body of literature on higher education students' experiences with ChatGPT for educational-academic activities. The findings indicated that positive experiences regard general benefits (e.g., fast generation of answers, ease of use, source of information), support for educational activities (planning educational practices/interventions, lesson plans), as well as provision of different perspectives and approaches (including strengthening children's social skills and ICT integration). Experienced limitations-challenges when using ChatGPT include reliability, validity of information, general/vague answers (e.g., ideas for educational practices), and limited contextual understanding. The need to submit multiple queries (specific prompts) in order to obtain more relevant information was experienced both as benefit and limitation. Students value and recommend ChatGPT as a useful and supportive tool for educational purposes, and highlight the necessity for enhancement of student skills and practices (e.g., evaluation of responses, and sources of information, submission of specific queries).

Overall, student teachers seem to acknowledge the main potential advantages of ChatGPT, considering and suggesting it as a useful and supportive tool for educational-academic activities, while reporting on some limitations/challenges. Although ChatGPT facilitates and supports the academic process (Imran & Almusharraf, 2023), its potential risks and limitations should also be considered. For example, students should compare results from multiple sources, and responsibly and critically evaluate the information generated. The findings have implications for students, university policy and educators. The findings of this study will be taken into account in designing AI-related university courses. Student training on effective use of AI will increase their awareness and enhance their AI literacy and skills, while the tutors' role is crucial. Student AI-related practices may be linked to digital transformation in education (Nikolopoulou, 2022), and universities need to respond to AI technology changes by adopting new policies. AI is now ubiquitous in (students' and teachers') digital experiences (Mah et al., 2024), thus AI tools could be used to support educational practices, and enhance AI technology literacy. ChatGPT is an innovative AI tool, and its appropriate utilisation among university students is crucial for shaping the future learning environments.

Harnessing ChatGPT in higher education is a rapidly evolving field with potential for exploration and innovation. By the time, an increase in student awareness and familiarity with generative AI tools (such as ChatGPT) is expected. Future research could investigate, for example, long term effects of ChatGPT usage among university students, and make comparisons across academic disciplines or countries.

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